

Just the Impression and Pattern/Trace Evidence Portfolio

Introduction [00:00:05] Now, this is recording, RTI International Center for Forensic Science presents Just Science.

Voiceover [00:00:19] Welcome to Science, a podcast for justice professionals and anyone interested in learning more about forensic science, innovative technology, current research, and actionable strategies to improve the criminal justice system. In episode two of our 2021 NIJ R&D and Beyond Mini Season, Just Science sat down with Dr. Gregory Dutton, a physical scientist in the Office of Investigative and Forensic Sciences at the National Institute of Justice, to discuss NIJ's Impression, Pattern, and Trace Evidence research portfolio. Between latent fingerprints, firearms, footwear, paint analysis, and much more, the NIJ Impression, Pattern, and Trace Evidence portfolio encompasses a diverse array of forensic disciplines. As the scientist who oversees this portfolio, Dr. Dutton is constantly encouraging innovative solutions to forensic problems. Listen along as he discusses developing quantitative methods of comparison, the importance of collaboration between researchers and forensic science providers, and the NIJ's Impression, Pattern, and Trace Evidence research portfolio in this episode of Just Science. This season is funded by the National Institute of Justice's Forensic Technology Center of Excellence. Here is your host, Nicole Jones.

Nicole Jones [00:01:40] Hello and welcome to Just Science. I'm your host, Nicole Jones with the Forensic Technology Center of Excellence, a program of the National Institute of Justice. Today, our guest is Dr. Gregory Dutton who is a physical scientist who oversees the impression and pattern evidence and trace evidence R&D portfolio in the Office of Investigative and Forensic Sciences at the National Institute of Justice. Dr. Dutton, welcome to the podcast.

Gregory Dutton [00:02:02] Thanks, Nicole. Happy to be here.

Nicole Jones [00:02:04] So, Greg, what led to your current role as the impression and pattern evidence and trace evidence program manager with NIJ? How long have you been in this role?

Gregory Dutton [00:02:13] I came to NIJ just over eight years ago. Before that I was a chemist at NIST. I really had no particular attachment to forensic science before coming to NIJ. I had been a postdoc and research fellow at NIST for quite a while and was trying to think about what I was going to do next. I had the idea that I wanted to grow up and move away from the bench and into administration. I loved NIST and I loved working for the federal government. I thought I'm going to look for a program management job somewhere in the government. The type of research that I was in initially, I thought that might be Department of Energy or NSF, but an opening came up at NIJ and I interviewed, and it was a great fit. As a chemist, I was a natural fit for the trace evidence portfolio because NIJ had already had a seized drugs and toxicology program manager, but no one was covering trace. That was kind of the first portfolio I took over at NIJ was trace, and we were light on program managers, so someone needed to take over impression and pattern. Things that cover like latent prints, firearms and toolmarks, and I picked that up.

Nicole Jones [00:03:34] So Dr. Dutton, I know over the last several years there's been a desire to bring statistics and measurement of error into the pattern evidence disciplines specifically with latent fingerprints, firearms, footwear. How has that influenced the NIJ R&D portfolio?

Gregory Dutton [00:03:49] Great point. It's had a big impact, especially on the impression and pattern evidence portfolio that I see. I've actually been able to see that happening in my time, especially since the 2009 NAS report that has been one of the biggest issues in the forensic sciences is bringing on automated quantitative methods of comparison. Being able to put on a sound statistical standing, the value of the evidence that's being presented. When I came on in 2013, I was still able to see a little bit of the struggle within some of the fields over this issue. NIJ certainly at that point had already been putting a lot of funding into these issues. Developing quantitative methods of comparison and bringing in the statisticians to help. One of the first inter-agency meetings that I was part of was with National Science Foundation and the American Statistical Association. We were trying to identify members of the ASA that had some interest in forensic science and might be willing to serve as reviewers on our peer review panel to assess the scientific statistical value of the proposals. Ever since then definitely in IPE it's been the biggest issue. I actually can think of some of the first statisticians that we engaged with, with the ASA. They served as reviewers. One of them is a PI on some of our research grants now, so that's really paid off.

Nicole Jones [00:05:31] So, Greg, along the same lines, I know there's been researchers like Dr. Busey doing work on expansion of conclusion scales from three-point conclusion to five-point conclusion. Do you see an increase in that type of research moving forward?

Gregory Dutton [00:05:46] Yeah, that's the perfect follow on to what we were talking about before. Forensic science is interesting. There are a lot of parallels to, say medicine and the health sciences, where you're trying to look at the information that you have and then come to a conclusion, or make a decision. In health, it's like, can we identify the problem, make a diagnosis, and then identify the best course of action. There are some parallels and bringing in people like Tom Busey who have a lot of experience in this sort of cognitive science decision making analysis has been really important because it's the nature of forensic science that evidence is always going to be presented by human examiners in court. That's not going to change for a long time. We can put a lot of effort, and it's important to put a lot of effort into developing these automated methods to help the examiners, but it's always going to be a human who comes to a conclusion and then defends that. It's interesting you talk about the conclusion scales. I know that in Europe, where they tend to have centralized court systems, they've already moved toward standardized conclusions scales across a lot of forensic disciplines, and they've tied those to specific statistical thresholds. They'll calculate a likelihood ratio and then they'll tie that to a conclusion scale conclusion. We don't have that yet and I don't know that we ever will or that we should, but some degree of scrutiny over the value of the conclusion scales and how well that can be communicated to a jury is very important, and some degree of standardization of that is needed. A lot of that is underway. Generally, the NIST OSAC is the place where a lot of that is really happening and I think appropriately so, because obviously anything to do with standards is rightly in their purview. We certainly have done our part to help fund research that can help the community address those questions.

Nicole Jones [00:07:56] One of the other great advances in impression and pattern evidence over the last several years has really been fueled by NIJ's investment in 3-D imaging for firearms examination, especially the work that Ryan Lilien has been doing and others. The FBI has the Technology Working Group on three dimensional toolmark technologies that's helping other agencies adopt that technology. What are some of the barriers that you see or you have heard as far as adopting optical topography and other 3D imaging technologies for firearms examination?

Gregory Dutton [00:08:31] 3D imaging for firearms and toolmarks is a really great example of a forensic discipline incorporating new technology and moving forward. It's a great example, but it's at an interesting point where you mentioned the 3D 2T Technology Working Group, which brings together the practitioners and researchers to try to iron out standards for incorporating technology. Everyone knows that 3D imaging for firearms is the way to go for reliable firearms examination, but most firearms and toolmark units don't have the technology yet. They don't have the instruments yet. We've seen with them that it's key to have a few examples of agencies that have adopted the technology and can demonstrate to others the value of it. That's the point where they're at now. You've got a few that are using it, but in order for others to adopt it, they're going to have to see that example and then somehow get the funding to put it in their units. That funding may be the biggest threshold at this point. I found it really fascinating to see this happen just at my time at NIJ. You mentioned Ryan Lilien at Cadre Research. He's had a string of NIJ grants which were really important to keep him working on the topic. We also funded NIST through several interagency agreements. To keep talented researchers working on a topic long enough is so hard sometimes when you're trying to find the funding and the justification to keep funding a line of research, but you get talented people working on a problem. Let them work on it long enough and you're going to see some good results and we've seen that with this. It's really gratifying to see Cadre, our NIJ funded grantee, NIST, and FBI working together as the linchpins of this community. Firearms is in good shape for the future and a great example for other disciplines.

Nicole Jones [00:10:44] Let's switch topics a little bit. Let's talk a little more about the trace evidence part of the portfolio. I know over the past few years there's been some advances, new spectroscopy methods, as well as the implementation of machine learning for the identification and classification of trace evidence such as paint and glass fibers. What are some of the things that you're seeing as far as the new and upcoming research in trace?

Gregory Dutton [00:11:08] Trace is interesting. With trace evidence, we're talking about things like paint, glass, fibers, dyes in fibers, pigments, and soil. We're typically talking about small amounts of materials that are transferred. Analysis of these kinds of materials is the kind of thing that analytical chemistry has been concerned with for forever. There are always new techniques that are being developed. Always more sensitive, more discriminating techniques. I think one of the strengths that I bring since I come from outside, so I'm a chemist. I didn't grow up in forensic science. I don't have the sort of preconceptions of well, this is the way we've always done it. I'm always reaching out to the analytical chemistry community more broadly to try to bring people in. The trace evidence portfolio is always trying to keep up with that. Another thing that's important for trace is it often deals with analyzing manufactured materials. Paint, glass, plastics, the universe of manufactured materials out there is always changing. It's always important to keep acquiring databases of material properties, reference collections so that forensic trace examiners have the appropriate references to compare to. That's always also an issue with trace. You mentioned machine learning. Perfect point, trace especially. I think this is also something that is bleeding over into other forensic disciplines. I saw this primarily starting in trace with a few more sophisticated PIs that we had earlier on. Now it's almost routine. It would be surprising if a trace portfolio project didn't incorporate some type of machine learning in order to classify the material that you're analyzing. Machine learning is central to trace, and its use is growing across other forensic disciplines, too.

Nicole Jones [00:13:19] So one of the important things that I heard you mention, Greg, is the need for databases, to have those reference databases to be able to search again. I know one thing that always comes up at the end of a research project, when the funding goes away, how do you sustain those databases? What do you think is the long-term solution to being able to sustain some of those reference databases?

Gregory Dutton [00:13:43] Yeah, that is a tough issue, and we certainly haven't solved it. So the best cases of those are when the grantees themselves put an effort toward developing the infrastructure to keep those databases hosted. University of Central Florida has continued to host a number of their databases that they've developed under our R&D projects, and that's an excellent example. We always want the public to have access to the information that our grants produce, but we don't have the infrastructure ourselves to keep hosting that information, so NIJ can't host the database. Where's it going to go? Either the grantee puts the effort and money into keeping that up or, you know, depending on the field of study, there's certain fields that they have their own databases. For sequencing data in biology, the federal government has developed these big databases, GenBank, and other databases to keep that for the community. For our researchers it's more a matter of uploading it and coding it properly so that someone can come in and find it later and know that's what they were looking for. It's becoming more of an issue. Across the federal government there's a drive toward open data, and I think some of the larger agencies have or will soon be requiring the availability of data to the general public. Often for things like this, the smaller agencies are exempted initially. That might happen for us, but it's an issue that we're going to have to figure out.

Nicole Jones [00:15:22] So speaking of sequencing technologies, there's some great advances in genomic sequencing technologies, and there's recently been a lot of interest in profiling the human trace microbiome as an emerging tool for forensic applications. The NIH funded the Human Microbiome Project, which has also significantly improved the scientific and public recognition of the vital importance of the ecology and the importance of the composition of an individual's microbiome and revealing details about that individual's lifestyle and the possibility of new trace evidence. Has NIJ seen an increase in research applications focused on the use of human microbiome as a forensic tool?

Gregory Dutton [00:16:01] That's a great example - I'm glad you mentioned it - of science advancing in other fields that then can be folded back and used for forensic purposes. There was so much done. The Human Genome Project, a lot of that really sparked a lot of innovation in forensic DNA, Microbiome Initiative from years ago, and really sparked a lot of research, mostly in health sciences. We funded, I want to say, maybe starting in 2014, 2015, we were able to fund a cluster of projects related to trace microbiome. So here we're talking about, say, someone handle's an object, you know. Maybe you don't get any useful prints. Maybe you do get some prints, but you get no hits from AFIS. You could swab that for human DNA, but again, you might search that profile in CODIS, but maybe you don't get a hit. What could you potentially learn from that evidence that could help an investigation? So you might not have an easy hit to an individual, but can you take that evidence and try to learn something about the characteristics of the person that may have touched that if it's a suspect or a victim or whatever you're looking at. One of the ideas there was, can we take that evidence and analyze the microbiome? So the microbial traces - mostly we're talking about bacterial microbiome. Even more recently we've funded some work in the virome, especially of hair. The idea is to analyze the microbiome and try to get a sense of the characteristics of the person who may have contributed that. For trace microbiome, we're mostly talking about skin, human skin microbiome. It's the bacteria that live on our skin. It's been shown recently that those microbiomes are fairly

stable over time for people and doesn't necessarily change abruptly. The characteristics are tied to aspects about you that may be significant. Sex, age, lifestyle, things like your diet, disease state, and things like that. Now, because of that, we had some projects that were pursued by some leading microbiome researchers who had demonstrated some of these things, the stability of the human microbiome. They thought, OK, if that's true, can we see if there's some value of this for forensic questions. So if we have that touched object, could we infer something about the person? We funded a few projects on this and the results are interesting. I think they demonstrate that there is potential for forensic use, but they're limited. For one thing, one of the biggest challenges is you need to collect this evidence and freeze it very quickly because the microbiome evolves on a surface. You need to collect it fast and preserve it fast. That is not always likely to happen. Another challenge is that they have the best results when they had a small population that they were comparing to, which is not surprising. If you're only trying to discern between a few people, you've got a better chance. For a larger set, more challenging, although they were successful in some cases to do sort of broad classifications, so that's good. I'd say that the most promising direction for this trace microbiome currently is it being used in conjunction with human DNA. Say you've got a biological evidence sample. Maybe it could be like a touch DNA sample, or it could be something else. Depending on the quality of the sample and the age of the sample, you might not get a full CODIS profile. If you were also analyzing for the microbiome, it might give you some additional information. I think the biggest value for trace microbiome now is kind of in conjunction with human DNA analysis.

Nicole Jones [00:20:12] That makes perfect sense. I know over the past several years, NIJ has conducted outreach to the broader scientific community to connect researchers whose work has a nexus of forensic science. We just talked a little bit about the researchers in microbiome as well as people like Tom Busey who are researchers in human cognition outside of forensics, even, that are applying their research to forensic science problems. Do you find that the broader scientific community has an interest in the challenges of forensic science?

Gregory Dutton [00:20:42] I think generally they do have an interest. So in the broader sciences, they always want to explore how they can use their science to make an impact. Forensic science, it's clear that they're making a direct contribution, I think, to society. A lot of the challenge I think is in showing them how they could apply their expertise in their science to forensic problems. For people who are sort of further afield and outside of typical engagement with forensic science, it's more a matter of just showing them what the current issues are that we're facing and giving them a chance to see if there's something they can contribute because often they might not necessarily know. Typically, researchers in the physical sciences and life sciences, their primary concern is often the fundamental research that's typically the biggest focus of their lab. Often if we engage with them and get them interested in doing some forensic science, it'll be maybe as a second line of applied research, which is great, right, if we can get them engaged in that, but it's not necessarily the thing that they are out there looking for. We have to maybe help them find it. Another big avenue that we have engaged in recent years, the past five years, has been Pittcon. The Pittsburgh conference is a big analytical chemistry and spectroscopy conference and we have used that. We've organized an NIJ forensic science symposium at Pittcon for the past five years for two reasons. One, we want to use it as an avenue for our funded researchers to present their research to an audience of their peers, basically, and we also like to use it as an opportunity to pitch our programs and show other researchers who would be attending there the kind of work that we fund and give them a chance to see that it's the type of research that they also are doing and they could easily do. It's a bit of a pitch for our programs as well.

Nicole Jones [00:22:53] As part of your outreach efforts to engage the broader scientific community, do you and how do you foster collaboration between researchers on a broader scale and the forensic science service providers?

Gregory Dutton [00:23:06] That's a good question. That can be tough. NIJ, we're well-positioned to help do that, but we can't do it all by ourselves. We're certainly lucky in that we have a foot in both camps, the research community and practitioners. I would say that in the time that I have been managing my programs, I've seen a better job generally of proposals coming in that already have some measure of collaboration or consultancy from practitioners, and it's kind of natural. First time applicants that come from outside forensic science, often they won't know practitioners. They won't have a practitioner collaborator. They'll often be some sort of fundamental typical forensic science questions that just aren't addressed in the proposal. Our reviewers will often flag this and say they really need to engage with a practitioner from the outset to help you frame your questions. We will often see in the second year, a resubmission come back, they've found someone, they've brought them in, and the application is that much stronger for it. In recent years I'd say they've done a better job and they jump on it from the beginning. They've got someone to help. We also have for probably five or six years, NIJ has had a separate program, the public labs program, we call it. It's research and evaluation of physical evidence in publicly funded forensic laboratories. That program explicitly requires a partnership between researchers and practitioners or at least a practicing laboratory. So that's a program that requires that partnership, and Frances Scott, the program manager for that, has started a Webpage on NIJ.gov to try to help partner labs and researchers together. There's kind of an explicit way to try to encourage that kind of engagement.

Nicole Jones [00:25:19] I know that you guys have forensic science technology working groups that help identify research needs. What are some of the big gaps that they have identified in the impression, pattern, and trace evidence discipline?

Gregory Dutton [00:25:32] We have a technology working group that we've had for a number of years, and we try to meet annually. Because of the pandemic it's been a little while. It's been more than a year since we've met. We convene a group of leading practitioners. We try to get a good mix of federal, state, and local lab representation, and we sit them down and we ask them to kind of hash out what are the things that you need. We're not necessarily asking them what research needs to be done, but more asking them what are the problems that they face so that we can present those problems, and the ones that are appropriately met through research can be proposed. We put those needs out for researchers to propose projects that can meet needs to really meet the problems that the field is facing and make sure that our programs are focused on the mission. That was just background. Now to get to your actual question, some of the things in impression pattern TWG needs that I've seen be fairly stable in my time, fairly new when I first came in were the issues that we talked about earlier about the need for quantitative methods of comparison. Automated quantitative measures of comparison, especially for pattern evidence, that's an ongoing need. Various permutations on that for the different pattern disciplines are always on the needs list. One other thing, the need for black box studies. So studies of examiner performance error rates. That continues to be a need in the pattern disciplines that we are meeting now. There are a number of ongoing black box studies in different pattern disciplines right now. For many of those, really the first error rate studies in their discipline were some of the first well-designed black box studies. Even once those are completed, it's not like that's going to be the end of the story. There is an ongoing need for good measures of examiner performance so that the courts can know what is the value

of this evidence that these examiners are giving. Impression, pattern, those have been some of the ongoing questions. Trace TWG needs, again, going back to our talk about machine learning, for trace always incorporating machine learning methods for classification, always important. An ongoing need again for trace is trying to find a way to keep up with new materials. Databases of new materials, new types of evidence, and reference collections. In the past few years in trace we've added a new TWG need on nanomaterials. A lot of the products that we buy these days, clothing, especially antimicrobial coatings on clothing and other things, incorporate nanomaterials. There's a question as to what value might those materials have in a trace analysis because they really haven't been looked at before. Another issue with new materials, 3D printed materials, trying to develop an understanding of how to characterize the chemical and physical properties of a 3D printed piece of evidence, and what of those properties might actually be useful for distinguishing what type of printing process or type of printer may have produced that to try to help with an investigative lead. Those are just some of the examples in trace of how the TWG needs have tried to keep up with that kind of evolving landscape of materials out there.

Nicole Jones [00:29:19] You read my mind, the black box studies. One of the other working groups that NIJ leads is the Forensic Laboratory Needs Technology Working Group. Several of those meetings, we've had presentations from some of the NIJ researchers that are doing these black box studies. Something that has come up with those studies is that it takes a lot of the examiners' time and all the different libraries that are participating. Is there any effort to, I guess, coordinate the overall approach of conducting black box studies just so that there's not so much demand on the practitioners themselves?

Gregory Dutton [00:29:57] That is a very good point, because I think, a couple of things, in order for a black box study to be well executed, it needs a large enough population of examiners to participate. As you say, they've got a lot of demands on their time. They just don't have the time to be participating in a ton of these things. It's so important for these projects to have the buy-in of the community that they're studying so that they trust the researchers that are doing it. They trust that it's going to be done right and the outcome is going to accurately reflect the work that they do. They all know, I think by this time that there's a need for this type of work. No field has a zero-error rate. They know that. They just want to make sure that their discipline is properly seen in a realistic light. Because of that, I think they do have a motivation to participate, but they have a fatigue from participating in too many of these things. It's actually, in that respect, it's probably important that there aren't too many of these studies going on simultaneously. I think for within a single discipline, you would not want to have more than one of these studies going on at the same time or right on the heels of each other. There is a reason to not fund them simultaneously, maybe, just in order to get good participation from the field. Having said that, there definitely is value in replication. Like I said before, there's no one error rate study that's going to be the end of the story for any discipline, even for the ones like latent prints that was the first really good example of a well-executed black box study. That's not the end of the story. Every study has its limitations. I think they might make some changes in how they would execute it now if they did it again. No single error rate is going to be the end of the story, we will see more of these studies go on. I think it's going to be most interesting to see the ones that are new for the fields that have not experienced them yet. For example, blood stain pattern analysis has a study that has ended, and the results will be coming out soon. I think there's a handwriting one that is going to be coming out soon, and some more firearms ones. It's really going to be exciting to see these, but there will be an ongoing need for more studies like this.

Nicole Jones [00:32:33] Another area that's been widely used in the UK that seems to be gaining traction in the United States is the use of footwear as forensic evidence. We had several invited speakers at the FLN-TWG meetings, including Jacqueline Speir, Lesley Hammer who presented on the footwear black box study, as well as Brian McVicker and John Grassel who presented on the FBI footwear database. Is this a research area that you are seeing growth in at NIJ?

Gregory Dutton [00:32:56] Yes, definitely and it's funny. I think I saw this presentation and I believe at one point they showed over time the research investments in footwear. I would have to say I was really happy for them to pull that up because it's really NIJ's impression pattern evidence R&D portfolio that has supported that. I've been really happy to see that happening. Again, I want to say it's so important to engage talented researchers to keep lines of research going. Jacqueline Speir at West Virginia, she is a great example of this, too. It's been so good to have her engaged in this. I'm glad you mentioned footwear. Footwear is a bit behind certainly firearms and toolmarks in incorporation of new technology, certainly things like the error rate studies, and footwear will be interesting to watch in the coming years. You mentioned that the UK, the UK has been way ahead in making use of footwear evidence - for a couple of reasons - the UK and I think Switzerland. So these are places that have single centralized authorities so they can kind of define a policy and make it happen. Also, they're smaller countries. The footwear evidence in the US has really suffered from a chicken and egg problem. Footwear evidence isn't collected because it's not used. It's not used because it's not collected. In the UK they depend on it a lot for investigative leads for linking crimes because they collect footwear impressions at booking just like fingerprints. They've got a database that they can search if they find a new impression at a crime scene. We don't have that here because we've got a decentralized system. So what it would take here would be the establishment of some local or regional areas to build reference databases that they could search against. I think we may start to see that kind of thing happen. I think the FBI Footwear Unit has really been a leader and we may see some examples of some regional database development. Footwear will be a fascinating corner to watch in coming years.

Nicole Jones [00:35:14] The NIJ has traditionally hosted the Forensic Science R&D Symposium with support from FTCoE at the annual meeting of the American Academy of Forensic Sciences. However, due to circumstances surrounding Covid-19, the decision was made for the Forensic Science R&D symposium to be held completely virtually this year. This led to one of the most attended symposiums on record with over 600 attendees. So what does that mean to you as a program manager?

Gregory Dutton [00:35:41] Yeah, it's really gratifying to see such a large audience. Our goal is really to reach the largest audience that we can. To see the biggest audience that we've had yet last year, even though it was a fully virtual meeting, that was great. One of the big lessons that we've all found throughout this whole pandemic thing is virtual meetings have a lot of value. They can work. They're important because you can reach anyone. It's not to minimize the value of the in-person meetings. The type of interaction that happens before, after, and in the room during the presentations, that's valuable. I think, you know, once we're able to go back to an in-person meeting, I'd love to go back to that, but if we can also have it virtual, have a webcast simultaneously, I think that would be ideal. It was great to see such a large audience.

Nicole Jones [00:36:40] Along with the high attendance, the event showcased more awards than ever before. Today, listeners can view the archive of the presentations and

the entirety of the poster session at our website. Based on the abstracts that NIJ received for consideration and the questions received from the audience, were there any common themes that stuck out this year?

Gregory Dutton [00:36:58] Yes, it's interesting. When we put together this R&D symposium for AAFS every year, we put out a call for abstracts to our PIs. The symposium that we were able to present is sort of shaped by the abstracts that we get. That depends on a few things. We're only getting abstracts by the motivated researchers. The ones that don't respond, we're not going to hear from them. Also, it's a reflection of kind of where our R&D portfolio is at that moment in time. We typically try to highlight the projects that are recently ended or almost ending that have a pretty much a complete story to tell or relatively complete. That also limits the number of the scope of the talks that we might hear. We also try to, often, shape a theme. We recently added a new forensic biology program manager, but before that I was covering that. Off the top of my head I can recall that one of the themes of the forensic biology part of the symposium ended up being touch DNA, also body fluid ID. We just happened to have several projects in those common areas that are right at the right time to present their work.

Nicole Jones [00:38:26] We're running near the end of our time together. Are there any final thoughts that you'd like to share with our listeners?

Gregory Dutton [00:38:31] I want to thank you for reaching out to us and doing a session on our R&D program. I've listened to some of the podcasts along the way and they've been great, and I am really happy for us to have the opportunity to talk about what we do. So thank you.

Nicole Jones [00:38:50] Thanks Greg. That's all that I have for today and all the time that we have left. I'd like to thank our guest, Dr. Greg Dutton, for sitting down with Just Science to discuss his NIJ R&D portfolio. Thank you, Greg.

Gregory Dutton [00:39:02] Thanks Nicole.

Nicole Jones [00:39:03] I'd also like to thank you, the listeners, for tuning in today. If you enjoyed today's conversation, be sure to like and follow Just Science on your podcast platform of choice. For more information on today's topics and resources in the forensic field, visit forensiccoe.org. Also, please follow the Forensic Technology Center of Excellence on Facebook, Twitter, and LinkedIn, or sign up for our newsletter for release dates on resources. I'm Nicole Jones and this has been another episode of Just Science.

Voiceover [00:39:31] Next week, Just Science sits down with Danielle McLeod-Henning, a physical scientist in the Office of Investigative and Forensic Sciences at NIJ, to discuss forensic anthropology, forensic pathology, and medicolegal death investigation. Opinions or points of views expressed in this podcast represent a consensus of the authors and do not necessarily represent the official position or policies of its funding.